IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re Application of Fulghum et al.	)))	Patent Pending
	)	Examiner: Mr. Kevin Burd
Serial No.: 10/720,492	))	
	)	Group Art Unit: 2611
Filed: 24 November 2003	))	
	)	Confirmation No.: 4554
For: Method and Apparatus for DS-CDMA Interference Suppression Using Code- Specific Combining	))))	
Attorney's Docket No: 4015-5133	))	

Mail Stop Appeal Brief-Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLY BRIEF

Dear Sir or Madam:

The applicants maintain the positions presented in the Appeal Brief filed 18 June 2008.

In addition to the already submitted arguments, the applicants submit this Reply Brief according

to the requirements of MPEP §1208 to address specific points of the Examiner's Answer mailed

4 February 2009. This reply brief is timely filed within two months of the Examiner's Answer.

While no fees should be required, if any fees or charges are required, the Commissioner is

hereby authorized to charge them to Deposit Account 18-1167.

(I.) STATUS OF CLAIMS

Claims 1, 2, 4 – 6, 8, 9, 11 -13, 15 – 17, and 19 – 89 stand rejected by the examiner.

Accordingly, the applicants appeal the rejection of claims 1, 2, 4 – 6, 8, 9, 11 -13, 15 – 17, and

19 – 89.

(II.) GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The examiner rejected independent claims 1, 5, 12, 16, 21, 28, 32, 49, 67, 77, and 83

under §102 as anticipated by Papasakellariou (US2001/0053177).

The examiner rejected independent claims 8 and 24 under §103 as obvious over

Papasakellariou in view of Eberhardt (US5754583).

The examiner rejected dependent claims 4, 20, 31, 33 – 35, 40, 44 – 48, 50 – 52, 58, 62

– 66, 68, 71, 74 – 76, 78, 78, 81, 82, 84, 85, 87, and 89 under §102 as anticipated by

Papasakellariou.

The examiner rejected dependent claims 2, 6, 9, 11, 13, 15, 17, 19, 22, 23, 25 – 27, 29,

30, 36 – 39, 41 – 43, 53 – 57, 59 – 61, 69, 70, 72, 73, 80, 86, and 88 under §103 as obvious

over Papasakellariou in view of Eberhardt.

(III.) ARGUMENT

The claimed invention is generally directed to reducing intersymbol interference in a

symbol of interest. To that end, the claimed invention uses code cross-correlations between

different unknown symbols received over multiple paths of a multi-path channel. More

particularly, the claimed invention determines cross-correlations between different symbols

based on code cross-correlations between spreading codes for the different symbols.

Subsequently, symbols from different symbol periods are combined using weighting factors

determined based on the cross-correlations to generate an estimate of the symbol of interest with reduced interference.

Claims 1, 2, 4 – 6, 8, 9, 11 -13, 15 – 17, and 19 – 89 are pending, of which claims 1, 5, 8, 12, 16, 21, 24, 28, 32, 49, 67, and 77 are independent. Independent claims 1, 5, 8, 12, 32, 49, 67, 77, and 83 explicitly require combining unknown symbols, e.g., an unknown symbol of interest and an unknown interfering symbol, based on the claimed code cross-correlations, where claims 5, 8, 12, 49, 67, 77, and 83 explicitly recite using weighting factors determined based on the code cross-correlation to combine the unknown symbols. Independent claims 16, 21, 24, and 28 explicitly require combining RAKE output symbols based on code cross-correlation based weighting factors. Independent claims 8, 12, 24, and 28 require the further combination of the output symbols generated by the code cross-correlation based combining to further reduce interference. All rejections are based on the conclusion that Papasakellariou teaches each of these limitations. However, this conclusion is incorrect.

Papasakellariou uses code cross-correlations as part of an interference reduction process within a RAKE receiver but separate from the RAKE combining process. More particularly, Papasakellariou determines the interfering signals and uses code cross-correlations to weight the determined (and therefore known) interfering symbols. The weighted interfering symbols are subtracted from the despread symbols output by a despreader to generate interference despread symbols with reduced interference. The interference reduced despread symbols are subsequently combined to generate a symbol estimate. See ¶s [0009] and [0081].

The Examiner's Answer is based on the following interpretation of Papasakellariou.

- The examiner asserts that Papasakellariou performs the claimed combining of unknown interfering symbols with unknown symbols of interest because Papasakellariou processes data symbols, which are all unknown to the receiver.

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- The examiner asserts that Papasakellariou uses code cross-correlations as part of a weighted symbol combining process, e.g., a RAKE combining process, because the code cross-correlations are used within a RAKE receiver to reduce interference.

- The examiner asserts that separate iterations of the iterative process described by Papasakellariou act as a separate combiner. Thus, the examiner believes that Papasakellariou teaches all of the claimed second combining operations (e.g., the code cross-correlation based combining of RAKE output symbols, subsequent combining output symbols generated based on the code cross-correlation based combining operations).

The applicants separately address each of these erroneous interpretations.

Papasakellariou fails to use code cross-correlations to combine <u>unknown</u> interfering symbols with unknown symbols of interest. Instead, Papasakellariou explicitly relies on <u>known</u> interfering symbols. In particular, Papasakellariou explicitly teaches determining the interfering signals <u>before</u> using the code cross-correlations to weight the determined interfering signals and cancel interference from the despread symbols. Papasakellariou's weighted interference cancellation therefore relies on previously determined, and therefore <u>known</u>, interference symbols. Thus, the rejections of independent claims 1, 5, 8, 12, 32, 49, 67, 77, and 83 are improper.

Because Papasakellariou does not teach the claimed combining of unknown symbols, Papasakellariou necessarily fails to teach a subsequent combining operation that combines filtered output symbols generated by the claimed combining of the unknown symbols. Thus, the rejections of independent claims 8 and 12 are improper.

Papasakellariou also fails to teach using code cross-correlations as part of a weighted symbol combining process that outputs symbol estimates. Instead, Papasakellariou uses code

cross-correlations as part of an interference subtraction process that outputs despread symbols with reduced interference. The reduced interference despread symbols are subsequently combined to generate the symbol estimate. Simply because a RAKE receiver includes a described interference cancellation process does not mean that the interference cancellation process occurs as part of the symbol estimation process, i.e., as part of the RAKE combining process. This is especially true since Papasakellariou explicitly teaches that the interference cancellation (i.e., code cross-correlation based combining) occurs <u>before</u> the symbol combining operation used to generate the symbol estimates. Thus, the rejections of independent claims 1, 5, 32, 49, 67, 77, and 83 are improper.
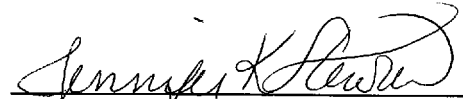
Further, Papasakellariou fails to teach combining RAKE output symbols using weighting factors determined based on code cross-correlations. As discussed above, Papasakellariou uses the code cross-correlations <u>before</u> any RAKE combining operations. Thus, Papasakellariou necessarily does not use the code cross-correlations as part of any post-RAKE combining operations. While Papasakellariou does teach combining symbols after each iteration of the interference canceller, such repeated combining operations still apply to despread symbols internal to the RAKE receiver, and are not applied to the RAKE output symbols. Thus, the rejections of independent claims 16, 21, 24, and 28 are improper.

Because Papasakellariou does not teach using code cross-correlations to combine RAKE output symbols, Papasakellariou necessarily fails to teach a second combining operation that combines filtered output symbols that result from the code cross-correlation based combining of the RAKE output symbols. Thus, the rejections of independent claims 24 and 28 are improper for this reason as well.

In light of the above remarks and the remarks presented in the previously filed Appeal

Brief, the applicants respectfully request that the Board vacate the pending rejection of all

pending claims.

Respectfully submitted,

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